



**UNITED STATES DEPARTMENT OF COMMERCE**  
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
09/146,839	09/03/98	SRINIVASAN	MI22-1017

021567 MM32/0218  
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EXAMINER

MAI, A

ART UNIT PAPER NUMBER

2814

DATE MAILED: 02/18/00

**Pleas find below and/or attached an Office communication concerning this application r  
proceeding.**

**Commissioner of Patents and Trademarks**

# Office Action Summary

Application No.

09/146,839

Applicant(s)

SRINIVASAN ET AL.

Examiner

Anh D. Mai

Art Unit

2814

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).

## Status

- 1) ☒ Responsive to communication(s) filed on 19 January 2000.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1,3-8,10,11,13-28 and 35-42 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,3-8,10,11,13-28 and 35-42 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claims \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are objected to by the Examiner.
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. § 119

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).
- a) ☐ All b) ☐ Some \* c) ☐ None of the CERTIFIED copies of the priority documents have been:
1. ☐ received.
2. ☐ received in Application No. (Series Code / Serial Number) \_\_\_\_\_.
3. ☐ received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. & 119(e).

## Attachment(s)

- 14) ☐ Notice of References Cited (PTO-892)
- 15) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 16) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_.
- 17) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_.
- 18) ☐ Notice of Informal Patent Application (PTO-152)
- 19) ☐ Other: \_\_\_\_\_.

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## DETAILED ACTION

### *Specification*

1. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed. (Second reminder).

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1, 3-8, 10, 11, 16-20 and 35-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Maeda et al. '877.

With respect to claims 1 and 18, Maeda teaches a method of forming an insulating material similar as claimed including:

providing a substrate (101) within a reaction chamber at a temperature up to 400 degree C;

providing reactants comprising silicon, fluorine and ozone within the reaction chamber; and

depositing an insulating material, at a rate of from about 1000 Angstroms per minute to about 10000 Angstroms per minute, comprising fluorine, silicon and oxygen onto the substrate from the reactants. (See col. 2, ll. 50-60 and col. 5, ll. 16-19).

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Maeda discloses a chamber temperature at a lower range of the presently claimed range. However, no criticality has been established for such range.

With respect to claim 3, the fluorine containing silicon oxide material of Maeda can be deposited with the present of plasma.

With respect to claim 4, the silicon and fluorine of the reactants of Maeda are comprised within a common molecule.

With respect to claim 5, the silicon and fluorine of the reactants of Maeda are comprised within a common molecule having an Si-F bond.

With respect to claim 6, the silicon and fluorine of the reactants of Maeda are comprised by triethoxy fluorosilane.

With respect to claim 7, the fluorine in the insulating material of Maeda is present in Si-F bonds.

With respect to claim 8, the fluorine concentration in the insulating material of Maeda is within the claimed range.

With respect to claims 10, 11 and 38, since the deposition chamber of Maeda is atmospheric pressure CVD therefore the chamber pressure encompass the claimed range.

With respect to claims 16, 17 and 19, the reactants of Maeda comprise a molecule that includes both Si and F (triethoxy fluorosilane or F-TES) and another molecule that includes Si without F (tetraethylorthosilicate or TEOS).

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With respect to claim 20, the fluorine containing silicon oxide material of Maeda is deposited without the present of plasma.

With respect to claims 35 and 39, the atmospheric pressure CVD of Maeda is 760 Torr, therefore 600 Torr can be seen as proximate to atmospheric pressure.

With respect to claim 36, Maeda has established that the deposition rate of the insulating material is direct proportional to the flow rate of F-TES. Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention was made to arrive at the claimed deposition rate by increasing the F-TES flow rate of Maeda. (See Fig. 4).

With respect to claims 37 and 40, the temperature of 400 degree C is used by Maeda. Applicant, however, has not established the criticality of 500 degree C in comparison to 400 degree C.

With respect to temperature and pressure in the chamber, within purview of one having ordinary skill in the art, it would have been obvious to determine the optimum temperature and pressure of the deposition chamber. See *In re Aller*, Lacey and Hall (10 USPQ 233-237) "*It is not inventive to discover optimum or workable ranges by routine experimentation.*"

3. Claims 13-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Maeda as applied to claim 1 above, and further in view of Homma (U.S. Patent No. 5,288,518).

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Maeda teaches a method *supra* but fails to include phosphorus and/or boron in the insulating material.

However, Homma, in a similar method, teaches dopants such as phosphorus and/or boron can be incorporated in the insulating material. (See col. 4, ll. 19-27).

It would have been obvious to one having ordinary skill in the art at the time of the invention was made to include dopants in the insulating material of Maeda as taught by Homma to lower the reflow temperature.

4. Claims 21, 23 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Maeda, in view of Homma.

Maeda teaches a method *supra*, but fails to include boron, phosphorus or boron-phosphorus-containing precursor in the reactant gas.

However, Homma, in a similar method, teaches doping the insulating film using boron, phosphorus or boron-phosphorus-containing precursor. (See col. 4, ll. 19-27).

It would have been obvious to one having ordinary skill in the art at the time of the invention was made to include dopants in the insulating material of Maeda as taught by Homma to lower the reflow temperature.

5. Claims 22, 24 and 26-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Maeda '877, in view of Homma '518, as applied to claims 21, 23 and 25 above, and further in view of Monkowski et al. (U.S. Patent No. 5,104,482).

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Homma teaches a method as described supra but fails to use tetraethoxy phosphine (TEPO) and triethyl borane (TEB) as the sources for phosphorus and boron dopants.

However, Monkowski, in a method of forming a doped insulating material, teaches using TEPO and TEB as the sources.

It would have been obvious to one having ordinary skill in the art at the time of the invention to use the dopant sources TEPO and TEB to form the doped insulating material of Homma as taught by Monkowski because these sources have lower toxicity, decreased pyrophoricity and increased chemical stability.

### ***Response to Arguments***

6. Applicant's arguments with respect to claims 1,3-8, 10, 11 and 13-28 have been considered but are moot in view of the new ground(s) of rejection.

### ***Conclusion***

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within

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TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anh D. Mai whose telephone number is (703) 305-0575. The examiner can normally be reached on 8:30AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on (703) 306-2794. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

*A.M.*

Anh D. Mai  
February 16, 2000

*Olik Chaudhuri*